

CLAIMS

What is claimed is:

1. A method of monitoring an immersion lithography system,
comprising:

5 immersing a wafer to be exposed in a liquid immersion medium;
detecting an index of refraction of the immersion medium in a volume of
the immersion medium through which an exposure pattern is configured to
traverse; and
determining if the index of refraction is acceptable for exposing the wafer
10 with the exposure pattern.

2. The method according to claim 1, wherein the determining includes
determining if the index of refraction is within a predetermined range of
acceptability.

3. The method according to claim 1, wherein the determining includes
15 determining if the index of refraction is uniform from a first location in the
traversal volume to a second location in the traversal volume.

4. The method according to claim 1, wherein the determining includes
correlating a measured index of refraction at a measurement device wavelength
to an exposure index of refraction at a wavelength of the exposure pattern.

20 5. The method according to claim 1, wherein the index of refraction is
measured throughout the traversal volume.

6. The method according to claim 5, wherein the index of refraction is
measured with an interferometer assembly.

7. The method according to claim 6, wherein multiple beams are used to measure the index of refraction throughout the traversal volume.

8. The method according to claim 6, wherein at least one beam is scanned through the traversal volume to measure the index of refraction throughout the traversal volume.

9. The method according to claim 5, wherein the determining includes determining if the index of refraction is within a predetermined range of acceptability.

10. The method according to claim 5, wherein the determining includes determining if the index of refraction is uniform from a first location in the traversal volume to a second location in the traversal volume.

11. The method according to claim 1, further comprising controlling the immersion lithography system to defer exposing the wafer if the index of refraction is determined to be unacceptable.

12. The method according to claim 11, wherein the immersion lithography system is controlled to wait a predetermined period of time and repeat the detecting and determining if the index of refraction is determined to be unacceptable.

13. The method according to claim 11, wherein the immersion lithography system is controlled to send commands to an immersion medium control subsystem if the index of refraction is determined to be unacceptable.

14. The method according to claim 1, further comprising monitoring the immersion medium for presence of a foreign body in at least the traversal volume.

15. The method according to claim 14, wherein the foreign body is a at least one of a particle or a bubble.

16. The method according to claim 14, wherein the monitoring for the foreign body is carried out by detecting scattered light from a laser beam used to detect the index of refraction.

17. The method according to claim 14, further comprising controlling the immersion lithography system to defer exposing the wafer is presence of the foreign body is detected.

18. A monitoring and control system for an immersion lithography system, the immersion lithography system including a chamber for receiving a wafer to be exposed and immersing the wafer in an immersion medium and an imaging subsystem for directing an exposure pattern towards the wafer and through the immersion medium, comprising:

an immersion medium monitoring subsystem including an interferometer assembly for directing a test portion of a laser beam through the immersion medium and for directing a control portion of the laser beam around the chamber, and a detector assembly for receiving the test portion and the control portion, the detector outputting a signal indicative of an index of refraction of the immersion medium in a volume of the immersion medium through which the exposure pattern is configured to traverse; and

a controller, the controller receiving the signal indicative of the index of refraction and determining if the index of refraction is acceptable for exposing the wafer with the exposure pattern.

19. The monitoring and control system according to claim 18, wherein the determining includes determining if the index of refraction is within a predetermined range of acceptability.

20. The monitoring and control system according to claim 18, wherein the determining includes determining if the index of refraction is uniform from a first location in the traversal volume to a second location in the traversal volume.